Volume of Cylinders, Cones, and Spheres

Name: _____	Date: _____	Score: _____ / 24

Quick Review

Volume measures how much space a solid fills. For a **cylinder**, $V = \pi r^2 h$ — the circle area πr^2 times the height. A **cone** with the same base and height holds exactly *one third* as much: $V = \frac{1}{3}\pi r^2 h$. A **sphere** uses $V = \frac{4}{3}\pi r^3$. Always use the *radius* (half the diameter), and keep your answer in terms of π unless you're told to use $\pi \approx 3.14$. Volume is measured in *cubic* units.

◇ **Example:** Find the volume of a cylinder with radius 3 cm and height 10 cm. Leave your answer in terms of π.

⇒ The formula for a cylinder is $V = \pi r^2 h$. Plug in $r = 3$ and $h = 10$: first square the radius, $3^2 = 9$. Then multiply by the height: $9 \times 10 = 90$. So the volume is 90π cubic centimeters. Keeping the π symbol gives an exact answer.

Answer: $V = 90\pi$ cm^3

PRACTICE

Find each volume. Leave answers in terms of π unless noted.

1. Cylinder: $r = 5,\ h = 8$ _____
2. Cylinder: $r = 2,\ h = 7$ _____
3. Cylinder: $r = 4,\ h = 6$ _____
4. Cylinder: $r = 10,\ h = 10$ _____
5. Cylinder: $r = 6,\ h = 5$ _____
6. Cylinder: $d = 6,\ h = 9$ _____
7. Cone: $r = 3,\ h = 9$ _____
8. Cone: $r = 6,\ h = 10$ _____
9. Cone: $r = 5,\ h = 12$ _____
10. Cone: $r = 2,\ h = 6$ _____
11. Cone: $r = 9,\ h = 4$ _____
12. Cone: $r = 3,\ h = 7$ _____
13. Sphere: $r = 3$ _____
14. Sphere: $r = 6$ _____
15. Sphere: $r = 9$ _____
16. Sphere: $r = 1$ _____
17. Sphere: $d = 12$ _____
18. Cylinder: $r = 1,\ h = 9$ _____
19. Cone: $r = 6,\ h = 5$, use $\pi \approx 3.14$ _____
20. Cylinder: $r = 2,\ h = 10$, use $\pi \approx 3.14$ _____

♦ Word Problems

21. A water tank is a cylinder with radius 4 ft and height 6 ft. Find its volume in terms of π. _____
22. An ice cream cone has radius 3 cm and height 9 cm. How much ice cream fills it exactly? Leave your answer in terms of π. _____
23. A basketball is a sphere with radius 6 inches. Find its volume in terms of π. _____
24. A cylindrical can has radius 2 cm and height 10 cm. Using $\pi \approx 3.14$, find its volume to the nearest tenth. _____

Answer Keys

1. 200π
2. 28π
3. 96π
4. 1000π
5. 180π
6. 81π
7. 27π
8. 120π
9. 100π
10. 8π
11. 108π
12. 21π
13. 36π
14. 288π
15. 972π
16. $\frac{4}{3}\pi$
17. 288π
18. 9π
19. 188.4
20. 125.6
21. 96π ft^3
22. 27π cm^3
23. 288π in^3
24. 125.6 cm^3

Step-by-Step Explanations

1. $V = \pi r^2 h = \pi(25)(8) = 200\pi$.
2. $V = \pi(4)(7) = 28\pi$.
3. $V = \pi(16)(6) = 96\pi$.
4. $V = \pi(100)(10) = 1000\pi$.
5. $V = \pi(36)(5) = 180\pi$.
6. Radius is 3, so $V = \pi(9)(9) = 81\pi$.
7. $V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(9)(9) = 27\pi$.
8. $V = \frac{1}{3}\pi(36)(10) = 120\pi$.
9. $V = \frac{1}{3}\pi(25)(12) = 100\pi$.
10. $V = \frac{1}{3}\pi(4)(6) = 8\pi$.
11. $V = \frac{1}{3}\pi(81)(4) = 108\pi$.
12. $V = \frac{1}{3}\pi(9)(7) = 21\pi$.
13. $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(27) = 36\pi$.
14. $V = \frac{4}{3}\pi(216) = 288\pi$.
15. $V = \frac{4}{3}\pi(729) = 972\pi$.
16. $V = \frac{4}{3}\pi(1) = \frac{4}{3}\pi$.
17. Radius is 6, so $V = \frac{4}{3}\pi(216) = 288\pi$.
18. $V = \pi(1)(9) = 9\pi$.
19. $V = \frac{1}{3}(3.14)(36)(5) = 188.4$.
20. $V = (3.14)(4)(10) = 125.6$.
21. Use $V = \pi r^2 h = \pi(4^2)(6) = \pi(16)(6) = 96\pi$ cubic feet.
22. A cone's volume is $V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(9)(9) = 27\pi$ cubic centimeters.
23. A sphere's volume is $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(6^3) = \frac{4}{3}\pi(216) = 288\pi$ cubic inches.
24. $V = \pi r^2 h \approx 3.14(2^2)(10) = 3.14(4)(10) = 125.6$ cubic centimeters.

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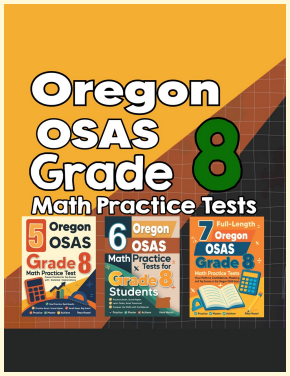

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